

Response to Office Action dated 10/11/06  
Title: Lightweight Thermal Heat Transfer Apparatus  
Date Filed: 01/24/02

Serial Number: 10/056,812  
Inventors: Thoman et al.  
Attorney Docket No.: NC 73962

**Amendments to the Claims:**

This listing of claims will replace all prior versions, and listings, of claims in the application:

***Listing of Claims:***

1-6. Canceled

7. (Currently Amended) A lightweight thermal heat transfer apparatus, comprising:

(a.) a core section, the core section having a cross sectional area, the core manufactured from a material that is polymeric based, the cross sectional area of the core section being substantially similar to a diamond shape; and,

(b) a laminate composite section, the laminate composite section having a plurality of thermally conductive fibers, the thermally conductive fibers being disposed around the core section, the thermally conductive fibers being oriented at a configuration similar to the core section, the thermally conductive fibers manufactured from a material selected from the group consisting of mesophase pitch material and carbon fiber, the thermally conductive fibers being supported in the laminate composite section with a matrix material, the matrix material being a material selected from the group of polymeric compositions, ceramic compositions and metallic compositions, the lightweight thermal heat transfer apparatus having edges, the thermally conductive fibers being oblique to the edges. The lightweight thermal heat transfer apparatus of claim 6, wherein the thermally conductive fibers are supported by pitched-based fibrous reinforcements.

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8. (Original) The lightweight thermal heat transfer apparatus of claim 7, wherein the lightweight thermal heat transfer apparatus is in substantially the shape of a rectangle.

9. (Original) A lightweight thermal heat transfer apparatus, comprising:

(a.) a core section, the core section having a cross sectional area, the cross sectional area of the core section being substantially similar to a diamond shape, the core section being manufactured from a material that is polymeric based; and,

(b) a laminate composite section, the laminate composite section having a plurality of thermally conductive fibers, the thermally conductive fibers being disposed around the core section, the thermally conductive fibers being oriented at a configuration similar to the core section, the thermally conductive fibers being imbedded in a matrix, the thermally conductive fibers being manufactured from mesophase pitch material, the thermally conductive fibers being supported by pitched-based fibrous reinforcements, the lightweight thermal heat transfer apparatus having edges, the thermally conductive fibers being oblique to the edges, the edges being coated with a conductive coating.

10. (Original) The lightweight thermal heat transfer apparatus of claim 9, the matrix being a material selected from the group of polymeric compositions, ceramic compositions and metallic compositions.

11. (Original) The lightweight thermal heat transfer apparatus of claim 10, wherein the conductive coating is manufactured from a material selected from the group consisting of metals, metal alloys and diamonds.

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12. (Original) The lightweight thermal heat transfer apparatus of claim 11, wherein the plurality of thermally conductive fibers are orientated in a common direction.

13. (Currently Amended) The lightweight thermal heat transfer apparatus of claim 12, wherein[,] the thermally conductive fibers[,] are discontinuous and dispersed in the matrix, and are in the translaminar (through-thickness) direction to further aid in heat dissipation.

14. (Currently Amended) The lightweight thermal heat transfer apparatus of claim 12, wherein[,] the thermally conductive fibers[,] are continuous and inserted through the thickness of the laminate, and are in the translaminar (through-thickness) direction to further aid in heat dissipation.

15. (Currently Amended) The lightweight thermal heat transfer apparatus of claim 12, wherein the core section comprises of a stiffener, the core section having 4 apexes, the stiffener having a first end and a second end, the first end and the second end of the stiffener being disposed at opposite apexes such that a stiffened apex region is created and the diamond shape of the core section is maintained.

16. (Currently Amended) The lightweight thermal heat transfer apparatus of claim 15, further comprising of a plurality of plies, ~~the core section having a plurality of apexes,~~ the plurality of plies attached to at least one of the apexes such that the plurality of plies give local area support and added heat transfer capabilities.

17. (Currently Amended) The lightweight thermal heat transfer apparatus of claim 16, further comprising of two groups of a plurality of plies, ~~the core section having four apexes,~~ one

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group of the plurality of plies are attached at one apex, and the other group of plurality of plies  
attached at an opposite apex.